TABLE 2-1

SUMMARY OF SITE AREAS, MEDIA,CONSTITUENTS OF INTEREST, AND USEPA PROPOSED ACTION LEVELS TO BE ADDRESSED BY CMS

Site Area	Medium	Approximate Lateral Extent (ft^2)	Approximate Vertical Extent	Constituent(s) of Interest	Measured Level[b]	USEPA Proposed Action Level
A	Soils	--[c]	--[c]	--[c]	--	--
B	Surficial Soils	7,400	0-4 in.	Cd	199	40
				Pb	355	24.9
				As	18.4	12
B	Drainage Ditch Surface Water	--[c]	--[c]	Cd	37.9 ppb	9.5
C	Surficial Soils	30,000	0-4 in.	Pb	80.7	24.9
				As	21.7	12
D	Shallow Soils	--[c]	0-4 in.	Pb	37.4	29.9
F	Surficial Soils	47,000	0-4 in.	Pb	87.5	25.9
				As	17.6	12
G	Surficial Soils	49,000	0-4 in.	As	18.5	12
				Pb	29.1	24.9
G	Shallow Soils	49,000	0.5 ft. - 3.3 ft	Cd	85.2	40
			0.5 ft - 3.3 ft	Pb	189.9	29.9

[a]Reference Corrective Measures Study (Partial Submittal), ECKENFELDER, INC., June 1990.
[b]Concentrations in ppm unless otherwise noted.
[c]Under evaluation.

TABLE 2-2

SUMMARY OF SHALLOW GROUNDWATER ANALYTICAL DATA FOR MONITORING WELLS NEAR SITE AREAS COMPARED TO USEPA ACTION LEVELS

Site Area	Nearby Monitoring Wells	Summary of Detected Concentrations[a]		USEPA Action Level	
		Barium	Cadmium	Barium	Cadmium
A, B, C	3-S	910	4.0	1,000	10
		1,200	1.4	1,000	10
		1,300	2.1	1,000	10
	4-S	BMDL	11.8	1,000	10
		830	14.3	1,000	10
		720	1.9	1,000	10
D	5-S	530	6.5	1,000	10
		610	9.7	1,000	10
		750	4.2	1,000	10
E (Former Wastewater Treatment Ponds)	5-S	530	6.5	1,000	10
		610	9.7	1,000	10
		750	4.2	1,000	10
	6-S	1,500	18.3	1,000	10
		1,100	25.7	1,000	10
		1,200	7.7	1,000	10
F	7-S	BMDL	8.3	1,000	10
		BMDL	4.0	1,000	10
		310	1.8	1,000	10
G	8-S	1,900	11.7	1,000	10
		830	6.9	1,000	10

[a]Concentrations given in ppb.

- Reduce erosion (via wind and water) and runoff of site constituents from former site disposal areas.

- Reduce infiltration of former site disposal areas by incident precipitation.

- Reduce the potential for future groundwater contamination from constituents present in identified SWMUs.

- Reduce the potential for future exposure to groundwater contamination by on-site or off-site human receptors.

2.3 IDENTIFICATION AND SCREENING OF POTENTIAL CORRECTIVE MEASURE TECHNOLOGIES

Technologies which have potential use as corrective measures will be identified and screened by the four step process as listed below:

- Identification of general response actions (based on the Corrective Action Objectives) appropriate to the environmental conditions at the site and to individual site areas.

- Identification of potential corrective measure technologies.

- Preliminary screening of potential corrective measure technologies.

- Selection of corrective measure technologies.

Selection and pre-screening of appropriate candidate technologies as well as initial screening of corrective measure technologies will use the following USEPA documents as guidance:

- "Corrective Measures for Releases to Groundwater from Solid Waste Management Units" (USEPA, 1985b).

- *RCRA Corrective Action Interim Measures Guidance* (USEPA, 1988b).

- "RCRA Corrective Action Plan (CAP)" (USEPA, 1988c).

- *Handbook for Evaluating Remedial Action Technology Plans* (USEPA, 1983).

- *Handbook--Remedial Action at Waste Disposal Sites* (USEPA, 1985c).

- "Interim Guidance on Superfund Selection of Remedy" (USEPA, 1986c).

- *Compendium of Costs of Remedial Technologies at Hazardous Waste Sites* (USEPA, 1987b).

- *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988d).

- *Remedial Action Costing Procedures Manual* (USEPA, 1987c).

Corrective Measure technologies will be considered with the following general requirements in mind:

- Corrective Measures must be protective of human health and the environment.

- Applicable federal and state public health and environmental action levels.

- Cost effectiveness as compared to the degree of environmental protection provided by potential corrective measure technologies will be considered, but will not be used as the sole criterion for eliminating technologies.

Figure 2-1 depicts the general process for identification and screening of potentially applicable corrective measures. Potentially applicable technologies will undergo a preliminary screening based on site and waste characteristics and technology limitations. Potential factors which may be considered in this preliminary technology screening are listed in Table 2-3.

TABLE 2-3

SITE AND WASTE CHARACTERISTICS AFFECTING CORRECTIVE MEASURE TECHNOLOGY SELECTION

Site Characteristics	
Site waste volume	Depth to bedrock
Area	Depth to aquitard(s)
Site configuration	Direction(s) and rate(s) of groundwater movement
Slope/topography	Potential receptors
Soils characteristics	Existing land use
Climate	Potential future land use
Drainage features	Surface water characteristics and use
Water bearing zone characteristics	Surface water discharge considerations
Ground/surface water recharge	
Vadose zone characteristics	

Waste Characteristics	
Quantity and concentration of contaminants	Attenuation factors
Volatility	Thermal properties
Biodegradability	Density
Carcinogenicity	Homogeneity
Acute/chronic toxicity	Persistence
Solubility	Bioaccumulation factors
Treatability	

Technology Characteristics	
Level of technology develompent	Performance record
Construction problems	Operation difficulties
Maintenance problems	Reliability
Applicability	Implementability

The process described above is the general manner in which site remedies will be identified and evaluated. Based on the findings and conclusions of previous studies and the knowledge of existing site use and operations, however, the identification and screening of potentially applicable technologies for this site is relatively straightforward and will not require an extensive evaluation of remedial alternatives. As previously discussed, it has been determined that soils at various depths in certain site areas containing constituents above action levels are the primary concern relative to the need for corrective measures. The potential for future impacts to groundwater will also be addressed by evaluating remedies in terms of reduction in potential sources of groundwater contamination.

Based on corrective action objectives previously identified, general response actions which appear to be most appropriate at this time are source control and, to some extent, removal and treatment. Corrective measure technologies which appear appropriate for addressing these general response actions are presented in Table 2-4. It should be noted that the "No Further Action" general response action is usually considered as a base case for comparative purposes. As a result of comparing USEPA established action levels to measured concentrations of constituents of interest for this site, "No Further Action" may be appropriate for certain site areas. Other potentially applicable corrective measure technologies may be identified in the CMS process by the procedure described above. These technologies will be pre-screened and, if appropriate, carried forward for further evaluation.

2.4 CORRECTIVE MEASURE ALTERNATIVES EVALUATION AND REMEDY SELECTION

Once identified, corrective measure alternatives will be evaluated as prescribed by the guidelines presented in the "Scope of Work for the Corrective Measures Study at RMI-Sodium Plant (Scope of Work). Generally, the Scope of Work requires that corrective measures alternatives passing the initial screening will be evaluated based on technical, environmental, human health and institutional concerns. Capital and operation and maintenance costs will also be determined for corrective measure alternatives evaluated. Based on this evaluation of corrective measure alternatives, a final comparative evaluation will be performed using similar criteria

TABLE 2-4

PRELIMINARY IDENTIFICATION OF CORRECTIVE MEASURES TECHNOLOGIES

General Response Actions	Corrective Measure Technology	Corrective Measure Options	Description
No Further Action	None	Not Applicable	No Further Action
Institutional Action	Access restrictions	Fencing	Control to site or site area
		Deed restrictions	Deeds for property in the area of concern would include restrictions on land use
Source Control	Capping	Site revegetation	Apply layer of topsoil and revegetate site area
		Clay and soil	Compacted clay and soil over site area
		Asphalt	Spray application of a layer of asphalt over site area
		Concrete	Installation of concrete slab over site area
		Multi-layer	Clay and synthetic membrane covered by soil over site area
	Surface controls	Diversion/collection	Placement of dikes and/or drains to direct surface water away from site areas
		Grading	Contour surface to minimize surface water intrusion areas

TABLE 2-4 (Continued)

PRELIMINARY IDENTIFICATION OF CORRECTIVE MEASURES TECHNOLOGIES

General Response Actions	Corrective Measure Technology	Corrective Measure Options	Description
Removal/Treatment//Disposal Action	Excavation	--	Soils are removed using conventional earth moving equipment
	Stabilization/Solidification	--	Soils are mixed with one of several available stabilizing agents. The agents bind the soil reducing permeability and improving leach resistence
	On-site consolidation and placement	Engineered cell above water table	Soils are excavated and dewatered and/or otherwise treated and placed in an appropriately designed cell on-site above the water table.
	Off-site disposal	Off-site landfill	Soils are excavated, possibly treated, and shipped to an appropriate landfill.

to highlight the more appropriate corrective measure alternatives. This will simplify the alternative recommendation of the CMS and final remedy selection by the USEPA.

2.5 CMS REPORT

The report requirements of the Scope of Work will be addressed by the CMS Report. General topics to be addressed by the CMS Report are as follows.

- Facility Description
- Summary of the RFI
- Summary of Corrective Measures
- Cost Estimates

In addition, a preliminary schedule for corrective measure remedy implementation will be presented.

Included in Appendix C is the anticipated CMS report format to be used for presenting the results of the CMS. Sections 1.0 and 2.0 and a portion of 3.0 which includes the Revised Health and Environmental Assessment were previously provided in a partial submittal to the USEPA of the CMS report. No changes are anticipated in this portion of the report outline. Sections 4.0, 5.0 and 6.0, as generally indicated in Appendix C, will be included in the final report to present the results of the Corrective Measures Study.

2.6 CMS SCHEDULE

Due to the manner in which the RFI and HEA have focused on the potential corrective action requirements and objectives for certain site areas, a lengthy time period for CMS preparation will not be required. Based on the approach to the CMS outlined by this CMS Plan, the draft CMS report will be submitted to the USEPA on July 15, 1991. USEPA review and comment must be received on this CMS Plan no later than June 1, 1991, however, for this schedule to be met. Substantial modification to this CMS Plan will require modification to the USEPA submittal date. Monthly CMS Progress reports are requested under Task IV.A. in the Scope of Work. Due to the short time frame for performing this CMS, progress reports do not

appear necessary and will not be provided unless specifically requested by the USEPA. In the event that an unanticipated delay is encountered, a report will be promptly submitted to the USEPA.

A final CMS Report will be submitted to the USEPA within 30 days following formal receipt of the results of USEPA's review of the draft CMS Report.

APPENDIX A

SCOPE OF WORK FOR A CORRECTIVE MEASURES STUDY AT RMI-SODIUM PLANT

ENCLOSURE III

Scope of Work for a Corrective Measures Study
at RMI - Sodium Plant

OHD 000 810 242

TASK I: Identification and Development of the Corrective Action Alternatives

Based on the U.S. EPA's evaluation of the results of the RFI, the Permittee shall identify, screen, and develop the alternative(s) for removal, treatment, containment and/or other remediation of the areas of contamination which exceed action levels, as identified by the U.S. EPA.

A. Description of Current Situation

The Permittee shall submit an update to the information describing the current situation at the facility and the known nature and extent of contamination as documented by the RFI Report. The Permittee shall provide an update to information presented in the RFI regarding previous response activities and any interim measures which have been or are being implemented at the facility. The Permittee shall also make a facility specific statement of the purpose of the response, based on the results of the RFI. The staement of purpose should identify the actual or potential exposure pathways that should be addressed by corrective measures.

B. Establishment of Corrective Action Objectives

The Permittee, in conjunction with the U.S. EPA, shall establish site specific objectives for the corrective action. These objectives shall be based on public health and environmental criteria, information gathered during the RFI, EPA guidance, and the requirements of any applicable Federal statutes.

C. Screening of Corrective Measure Technologies

The Permittee shall review the results of the RFI and identify technologies which are applicable at the facility. The Permittee shall screen the corrective measure technologies and any supplemental technologies unlikely to perform satisfactorily or reliably, or that do not achieve the corrective measure objective within a reasonable period of time. This screening process focuses on eliminating those technologies which have severe limitations for a given set of waste and site specific conditions. The screening step may also eliminate technologies based on inherent technology limitations.

Characteristics which are used to screen applicable technologies are described in more detail below:

1. Site Characteristics

Site data should be reviewed to identify conditions that may limit or promote the use of certain technologies. Technologies whose use is clearly precluded by site characteristics should be eliminated from further consideration;

2. Waste Characteristics

Identification of waste characteristics that limit the effectiveness or feasibility of technologies is an important part of the screening process. Technologies clearly limited by these waste characteristics should be eliminated from consideration; and

3. Technology Limitations

During the screening process, the level of technology development, performance record, and inherent construction, operation, and maintenance problems should be identified for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated may be eliminated in the screening process.

D. Identification of the Corrective Measure Alternative(s)

The Permittee shall develop the corrective measure alternative(s) based on the corrective action objectives and an analysis of available technologies. The Permittee shall rely on engineering practice to determine which of the previously identified technologies appear most suitable for the site. Technologies can be combined to form the overall corrective action alternative(s). The alternatives developed should represent a workable number of options that appear to adequately address all site problems and corrective action objectives. The Permittee shall document the reasons for excluding technologies that might be feasible alternatives.

TASK II. Evaluation of Corrective Measure Alternatives

The Permittee shall describe each corrective measure alternative that passes through the initial screen in Task I and evaluate each alternative and its components. The evaluation shall be based on technical, environmental, human health and institutional concerns. The Permittee shall also develop cost estimates for each corrective measure.

A. Evaluation Criteria

The description of each corrective measure shall include, but is not limited to, the following: preliminary process flow sheets; preliminary sizing and type of construction for structures; and rough quantities of utilities required. The Permittee shall evaluate each alternative in the following areas:

1. Technical

The Permittee shall evaluate each alternative based on performance, reliability, implementability and safety.

a. The Permittee shall evaluate performance based on the effectiveness and useful life of the measure.

i. Effectiveness shall be evaluated in terms of the ability to perform intended functions, such as containment, diversion, removal, destruction, or treatment. The effectiveness of each measure shall be determined either through design specifications or site characteristics which could impede effectiveness shall be considered: and

ii. Useful life is defined as the length of time the level of effectiveness can be maintained. Most corrective measure technologies deteriorate with time. Each measure shall be evaluated in terms of projected service life of its components.

b. The Permittee shall provide information on the reliability of each corrective measure including its operating and maintenance requirements and its demonstrated reliability:

i. Operation and maintenance requirements include the frequency and complexity of the operation and maintenance. Technologies requiring frequent or complex operation and maintenance should be regarded as less reliable. The availability of labor and materials to meet these requirements shall also be considered: and

ii. Demonstrated reliability is a way of measuring the risk and effect of failure. The Permittee should evaluate the technology's reliability under analogous conditions, the flexibility to deal with uncontrollable changes at the site, and the impact on receptors or a failure.

c. The Permittee shall describe the implementability of each alternative, including the ease of installation and the time required to achieve a given level of response:

i. Constructability is determined by both internal and external facility conditions (e.g., location, depth to water table, availability of utilities, need for special permits, etc.). The Permittee shall evaluate what measures will facilitate construction under these conditions: and

ii. Time has two components that shall be addressed: the time it takes to implement a corrective measure and the time it takes to see beneficial results.

d. The Permittee shall evaluate each corrective measure alternative with regard to safety. This evaluation shall include threats to the safety of nearby communities and environments, as well as to workers during the implementation. Factors to consider are fire, explosion, and exposure to hazardous substances.

2. Environmental

The Permittee shall perform an environmental assessment for each alternative. The environmental assessment shall focus on the facility conditions and pathways of contamination actually addressed by each alternative. The assessment for each alternative will include, at a minimum, an evaluation of: short and long term beneficial and adverse effects of the response alternative; any adverse effects on environmentally sensitive areas; and an analysis to mitigate adverse effects.

3. Human Health

The Permittee shall assess each alternative in terms of the extent to which it mitigates short and long term potential or actual exposure to any residual contamination and protects human health both during and after implementation of the corrective measure. Each alternative will be evaluated to determine the level of contaminants through various media, and the reduction over time. The residual levels from each alternative must be compared with existing criteria, standards and guidelines acceptable to the U.S. EPA.

4. Institutional

The Permittee shall assess relevant institutional needs for each alternative. Specifically, the effects of Federal, State and local environmental and public health standards, regulations, guidance, advisories, ordinances, or community relations on the design, operation, and timing of each alternative.

B. Cost Estimate

The Permittee shall develop an estimate of the cost of each corrective measure alternative, and for all phases of the action. The cost estimate shall include both capital and operation and maintenance costs.

1. Capital costs consists of direct (construction) and indirect (nonconstruction and overhead) costs.

a. Direct capital cost include:

i. Construction costs: Materials, labor and equipment required to install the corrective measure;

ii. Equipment costs: Treatment, containment, disposal and/or service equipment necessary to implement the action:

iii. Land and site development costs: Expense associated with the purchase of land and development of existing property: and

iv. Building and service costs: Process and nonprocess buildings, utility connections, purchased services, and disposal costs.

b. Indirect capital costs include:

i. Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives:

ii. Legal fees and license or permit costs;

iii. Startup and shakedown costs;

iv. Contingency allowance: Funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strikes and inadequate facility characterization.

a. Operation and maintenance costs are post-construction costs necessary to ensure continued effectiveness of a corrective measure. The Permittee shall consider the following operation and maintenance cost components:

b. Maintenance materials and labor costs: Costs for labor, parts, and other resources required for routine maintenance of facilities and equipment;

c. Auxiliary materials and energy: Costs of items such as chemicals, electricity, water and sewer service, and fuel;

d. Purchased services: Sampling costs, laboratory fees, and professional fees;

e. Disposal and treatment costs: Costs of transporting, treating and disposing of waste materials and residues.

f. Administrative costs;

g. Insurance, taxes and licensing costs;

h. Other costs: Items that do not fit into any of the above categories.

TASK III. Justification and Recommendation of the Corrective Measure(s)

The Permittee shall justify and recommend a corrective measure alternative using technical, human health, and environmental criteria. This recommendation shall include summary tables which allow the alternative(s) to be easily understood. Tradeoffs among health risks, environmental effects, and other pertinent factors shall be highlighted. The U.S. EPA will select the corrective measure alternative(s) to be implemented. At a minimum, the following criteria will be used to justify the recommended alternative.

A. Technical

1. Performance;

2. Reliability;

3. Implementability;

4. Safety.

B. Human Health

The corrective measure selected must comply with existing U.S. EPA criteria, standards, or guidelines for the protection of human health. Corrective measures that provide the minimum level of exposure to contaminants and the maximum reduction in exposure with time are preferred.

C. Environmental

The corrective measure posing the least adverse impact or greatest improvement on the environment, over the shortest period of time will be favored.

TASK IV: Report Requirements

The Permittee shall prepare a CMS Report presenting the results of Task I through III and recommending a corrective measure alternative.

A. Progress

The Permittee shall provide the EPA with signed monthly progress reports for the CMS.

B. Draft

The draft CMS Report shall, at a minimum, contain:

1. A description of the facility

2. A summary of the corrective measures, including;

   a. Description of the corrective measures and rationale for selection of the recommended alternative;

   b. Performance expectations;

   c. Preliminary design criteria and rationale;

   d. General operation and maintenance requirements; and

   e. Long term monitoring requirements.

3. A summary of the RFI and its impact on the selected corrective measures;

4. Design and implementation precautions, including:

   a. Special technical problems;

   b. Additional engineering data required;

   c. Permits and regulatory requirements;

   d. Access, easements, rights of way;

   e. Health and safety requirements; and

   f. Community relations activities.

5. Cost estimates and schedules, including;

a. Capital cost estimates;

b. Operation and maintenance cost estimates; and

c. Project schedule;

Two copies of the Draft CMS Report shall be provided by the Permittee to the U.S. EPA.

c. Final

The Permittee shall finalize the CMS Report incorporating comments received from the U.S. EPA on the Draft CMS Report.

APPENDIX B

RESPONSES TO USEPA'S COMMENTS OF JULY 15, 1991 ON THE CMS WORK PLAN

APPENDIX B

CMS WORK PLAN
SECTION 1.0 COMMENTS

1. **Section 1.3.1, Page 1-4, Paragraph 2: Please state the criteria used to determine whether a metal concentration was "elevated" with respect to background. Please state what background value was used for a constituent when its background concentration was "BMDL". Also, please state in which well the cadmium concentration of 25.7 ppb was detected.**

   As stated in the Revised Supplemental Investigation report (page 4-7), wells 9-S and 10-S are considered background wells for shallow groundwater due to their locations with respect to the SWMUs. Where the constituent concentration was observed to be BMDL in the background wells (9-S or 10-S), the detection limit was the assumed background concentration (i.e., if the concentration measured was above the detection limit, that concentration was considered to have exceeded background for constituents for which "BMDL" was observed in background wells).

   The total cadmium concentration of 25.7 ppb was detected in well 6-S, as a result of the January 12, 1989 sampling event.

   The referenced section has been revised to reflect this information.

2. **Section 1.3.1, Pages 1-4 to 1-5, Paragraph 4: Please state the criteria used to determine background levels of metals in the bedrock groundwater. The description of the relative ratios of barium and chloride ions in the shallow and deep bedrock groundwater does not provide a convincing argument that the deep bedrock groundwater has not been impacted. The argument needs to be expanded to conclusively demonstrate that such a comparison is indeed valid, using references and appropriate documentation, other case studies, etc. Please note that it was concluded in the supplemental investigation that the bedrock aquifer is not fully confined and is**

influenced by the coal pile. Therefore, there is a better possibility that the RMI wastewater ponds could be affecting the bedrock aquifer as indicated by the elevated barium concentrations and the apparent influence of the coal pile on the aquifer. If the coal pile is influencing the bedrock aquifer, then it lends credence to the possibility that the wastewater ponds could be affecting the bedrock aquifer also.

As determined by the RFI and stated in the Revised RFI report (June 1990), monitoring well 11-D is upgradient relative to the RMI Sodium Plant SWMUs and represents background conditions for the bedrock zone. Data from well 11-D were used to determine background concentrations of metals in the bedrock groundwater. The referenced section will be revised to reflect this comment.

With respect to the use of barium and chloride ion ratios to determine impact to the bedrock groundwater, further discussion and supporting information was presented in the Revised Supplemental Investigation report (page 4-13) as follows:

"Major ion data and barium/chloride ratios also support the conclusion that the deep bedrock water has not been impacted by the shallow groundwater. The major ion data (Section 4.2.3 of the Revised RFI) demonstrate that the two groundwaters have distinctively different chemistry. Barium/chloride ratios (Section 6.1.2 of the Revised RFI) were also utilized because chloride is a very conservative ion and would migrate along a downward vertical gradient more quickly than barium, which may be attenuated more readily than the chloride. Barium in the deep groundwater occurs at higher concentrations than in the shallow groundwater while chloride concentrations in the deep groundwater are much lower than in shallow groundwater. These inverted ratios indicate that the barium in the deep groundwater could not have originated from the shallow aquifer, but rather is naturally occurring. In addition, the Ohio Department of Natural Resources publication "Characterization of Trace Metals in Ohio Brines" (Open File Report 89-1, 1989) indicates that barium concentrations in the Chagrin Shale in southern Ohio range from 8,000 ppb to 82,000 ppb. These concentrations are similar or higher than those in the Chagrin Shale at the RMI site indicating that barium at these levels is likely

to be naturally occurring. Therefore, water quality in the bedrock groundwater is not affected by the SWMUs on site."

Although it was concluded in the Revised Supplemental Investigation report that the bedrock zone is not fully confined and that the piezometric surface of the bedrock zone may be influenced by the coal pile, based on the barium/chloride ion ratio discussion above, it is evident that the bedrock groundwater has not been affected by the activities at the RMI Sodium Plant site. In addition, as discussed on page 4-12 of the Supplemental Investigation report, recent observations indicate that there is a net upward vertical gradient between the bedrock and shallow groundwater in the vicinity of the wastewater treatment ponds. Even though a downward component of flow exists in the areas away from the ponds, the low permeability and considerable thickness of the unweathered glacial till and the relatively small hydraulic gradient between the two water bearing zones indicate that this downward component of flow is minimal. Therefore, although the piezometric surface in the bedrock groundwater zone may be affected by the coal pile, barium/chloride ratios, hydraulic gradient, and hydraulic conductivity data all indicate that the bedrock zone has not been affected by activities at the RMI Sodium Plant site.

Because the above additional information is a result of the Supplemental Investigation, Section 1.3.3 of the CMS Work Plan ("Supplemental Site Investigation for the RFI") will be revised to incorporate this information rather than the referenced section, which pertains only to conclusions of the Revised RFI report.

3. **<u>Section 1.3.2, Page 1-7, Paragraph 1</u>: Please see the previous comments for Section 1.3.1, Page 1-4, Paragraph 2 on "elevated" concentrations and in which well 25.7 ppb of cadmium was detected.**

Please see the response to Section 1.3.1, Page 1-4, Paragraph 2.

The referenced paragraph has been revised to reflect this information.

4. **<u>Section 1.3.2, Page 1-7, Paragraph 2</u>: Again, the supplemental investigation results indicate that there may be a better hydraulic**

connection with the bedrock aquifer than originally believed. Therefore, discharge of shallow groundwater to deep groundwater may be more likely.

As discussed in Comment No. 2 above, the findings and conclusions of the Revised Supplemental Investigation report (page 4-12) indicate that, due to the low permeability and considerable thickness of the unweathered glacial till and the relatively small hydraulic gradient between the two water bearing zones, the downward component of groundwater flow is minimal. Furthermore, indications are that there is a net upward vertical gradient between the bedrock and shallow groundwater in the vicinity of the wastewater treatment ponds. Barium/chloride ratios also indicate that the bedrock zone has not been affected by activities at the RMI Sodium Plant site. Therefore, the results of the Supplemental Investigation do not indicate that there may be a better hydraulic connection with the bedrock zone than originally believed.

The referenced section does not require revision.

5. <u>Section 1.3.2, Page 1-7, Paragraph 3</u>: **Please state why metals concentrations in bedrock groundwater were not compared with exposure criteria. The supplemental investigation indicates that the bedrock groundwater may be affected by the site more than originally believed.**

As has been previously demonstrated in Section 2.0 (Revised Health and Environmental Assessment) of the CMS (Partial Submittal); discussed in responses to USEPA comments on the Revised Supplemental Investigation report (reference the Revised Supplemental Investigation report, Appendix D, page 6, paragraph 2); further supported by the findings of the Supplemental Investigation; and previously discussed in Comment No. 2 above, bedrock groundwater quality is unrelated to the SWMUs. Therefore, comparison of groundwater quality in the bedrock zone with exposure criteria is not appropriate and was not evaluated in Section 2.0 of the CMS (Partial Submittal) report.

The referenced section does not require revision.

6. **<u>Section 1.3.2, Page 1-9, Paragraph 1</u>: Please provide the criteria used to both define a "significant degree" and to determine why cadmium was predicted to be the most mobile of site constituents.**

It is assumed that the request to define "significant degree" in this comment refers to the statement, "Toxicity tests performed on subsurface soils with the highest concentrations of Cd and Pb indicated that leaching of subsurface soils is not likely to occur to a significant degree". The criteria for the determination of "significant degree" were discussed in Section 2.2.2.2 of the CMS report (Partial Submittal). As discussed, the criteria were based on the results of the EP Toxicity analyses for Cd and Pb performed on samples SB-16 and SB-17 (these were the only subsurface samples which exceeded the EP Toxicity equivalent factors and only the EP Toxicity equivalent factors for Cd and Pb were exceeded). Because neither SB-16 nor SB-17 exceeded the EP Toxicity limits for Pb or Cd, it was determined that leaching of subsurface soils is not likely to occur to a significant degree.

The predicted mobility of Cd was discussed in Sections 2.2.2.1 and 2.2.2.2 of the CMS report (Partial Submittal). As discussed in these sections, soil/water partitioning coefficient (K_d) values were used to predict sorption or attenuation potential for the site constituents. Constituents with the greatest sorption or attenuation potential would be the least mobile. Based on K_d values, the following relative order of increasing sorption or attenuation potential for the site constituents was predicted as follows:

$$As \simeq Se < Cd = Hg < Ni < Ag < Cr < Ba < Pb$$

Other sources have described the following order of increasing sorption potential for some of the site constituents (US Nuclear Regulatory Commission, 1980):

$$Cd < Zn < Ba < Cu < Cr \simeq Pb$$

Therefore, although there are some discrepancies in expected mobility of site constituents because of the complexity of factors affecting sorption potential,

for the major waste constituents at the site (Ba, Cd, and Pb), it was predicted that Cd would be least sorbed (or most mobile), Pb would be most sorbed, and Ba would be intermediately sorbed, relative to Cd and Pb.

In Section 2.2.2.2 of the CMS (Partial Submittal), the relative potential of site constituents to leach from subsurface soils and become mobile in groundwater was predicted using retardation factors. Based on retardation factors calculated for the site constituents, it was predicted that Ni, As, Se and Cd would be the most mobile in groundwater of the site constituents, and that Ba and Cr would be the least mobile. Therefore, of the constituents of interest in groundwater, it appears that Cd would be more likely to be leached than Ba, and Cd is predicted to be one of the most mobile of the site constituents.

The referenced section has been revised to reflect the source of this information.

7. <u>Section 1.3.2, Page 1-10, Paragraph 3</u>: **It is stated that the only likely environmental receptors for surface waters were extremely tolerant lower aquatic species possibly present in Fields Brook. However, both the USEPA and M&E noted the presence of frogs and possibly minnows in the on site ditch during a site visit in September 1990. Therefore, it may be necessary to address the effect of surface waters (especially cadmium concentrations) on these aquatic species.**

The effect of on site surface waters on aquatic species has been addressed in Sections 2.3.3, 2.3.4, and 2.5.3 of the CMS report (Partial Submittal). As discussed in Section 2.3.3 and summarized in Section 2.5.3, it was noted that the on site ditches, including the DS tributary, are not believed to be of sufficient "depth or flow to support fish or higher forms of aquatic biota". The fact that frogs have since been observed in the on site ditches does not contradict this statement. It was then concluded in Section 2.5.3 that potential environmental receptors would be only of constituents which migrate off site via the DS Tributary and would include only extremely tolerant species of aquatic plant and animal life in Fields Brook.

In Section 2.3.4 of the CMS (Partial Submittal), concentrations of site constituents present in drainage ditch sample DW-G (the location deemed most representative of levels of constituents which may be migrating off site) were compared to Ohio Water Quality Standards and Federal Ambient Water Quality Criteria (AWQC). All measured concentrations of constituents in sample DW-G were within both the Ohio Water Quality Standards and the acute and chronic AWQC values, with the exception of Cd (measured at 2.1 ppb) which was slightly higher than the Ohio standard for warm water habit of 1.9 ppb. However, it is not believed that the warm water habitat designation is an appropriate use designation for the DS Tributary. The Cd value for DW-G is well within the agricultural water supply standard of 50 ppb. Therefore, it appears that the concentrations of site constituents present in the surface water drainage ditches at the RMI Sodium Plant which may potentially migrate downstream via the DS Tributary do not present a concern to aquatic biota. However, as further discussed in Comment No. 11, an action level for Cd in surface water has been assigned and was exceeded at one on site ditch location (DW-B). This action level was accepted since it is understood that it only serves to identify the area (near DW-B) and the constituent as needing to be further addressed in the final CMS report.

The referenced section does not require revision.

8. <u>Section 1.3.3, Page 1-11, 4th Bullet</u>: **It is stated that barium concentrations detected in groundwater during the supplemental investigation were similar to those previously documented. However, the barium concentration in well 9D from the supplemental sampling is over three times higher than for other sampling episodes (5,200 ppb vs 1,400 ppb). Please address this discrepancy.**

As indicated in the responses to the USEPA comments on the Revised Supplemental Investigation report (reference the Revised Supplemental Investigation report, Appendix D, page 7), the difference in barium concentrations in groundwater from well 9-D (resulting from different sampling events) may be related to matrix interferences. Barium is typically a difficult analyte for flame atomic adsorption resulting in the wide variability between replicate samples.

The referenced section has been revised to reflect this information.

9. **<u>Section 1.3.3, Page 1-11, 5th Bullet</u>: No information is provided concerning the reduction in groundwater cadmium concentrations across the site. Please state whether there are known or postulated causes of the reductions in cadmium levels.**

The information requested by this comment was provided in a response to USEPA comment on Section 4.3.1, Page 4-12, Paragraph 3 the Revised Supplemental Investigation report (see Appendix D of the Revised Supplemental Investigation report, page 8). As discussed, cadmium concentrations in the shallow groundwater have decreased considerably across the site, thus reducing the potential for future migration of significant quantities of cadmium off site. Although cadmium has been recently taken out of the wastewater process by RMI, the cadmium in groundwater in the vicinity of the ponds is postulated to also be related to leaching from the fill areas near the ponds. Therefore, the cause of the decrease in cadmium concentrations in the shallow groundwater is not necessarily related to the pond water but may actually result from the extremely wet winter in northeastern Ohio, providing additional infiltration (dilution) water, or cadmium concentrations in the source material (fill) may be diminishing with time because of partitioning.

The referenced section does not require revision.

10. **<u>Section 1.3.3, Page 1-11, 6th Bullet</u>: Please see previous comment for Section 4.3.1, Page 4-12, Paragraph 4 on the supplemental RFI report concerning the possible source of the four (Cd, Cr, Ni, and Zn) elevated metals.**

The previous comment requested clarification on whether the elevated metals (Cd, Cr, Ni, Zn) detected in groundwater samples from well 12-S are being attributed directly to the coal pile.

The information requested by this comment was provided in the response to the USEPA comment on the Revised Supplemental RFI report (reference Appendix D, page 8) in the following manner.

"Cadmium, chromium, nickel, and zinc are constituents of coal, and studies have shown that nickel and zinc, and to a lesser degree cadmium and chromium, result from runoff or leaching from coal piles (EPA 600/1-78-004m). The drainage ditch adjacent to the eastern RMI property boundary acts as a groundwater divide between the groundwater impacted by the coal pile and RMI property. Therefore, the elevated levels of metals detected in off-site well 12-S are apparently components of the low pH groundwater generated by the off-site coal pile, and not the result of migration of constituents from the Sodium Plant property."

The referenced section has been revised to reflect this information.

11. <u>Section 1.3.3, Page 1-12, 2nd Bullet</u>: **As previously stated, RMI Plant activities may be affecting the bedrock groundwater more than what was once believed. Also, the cadmium action level for surface water was exceeded in an on site surface water ditch sample.**

As previously discussed in Comment Nos. 2 and 5, barium concentrations in the bedrock groundwater are naturally occurring and are not affected by Sodium Plant activities. Therefore, the first paragraph under the second bullet on page 1-12 will not be revised.

In regard to the second paragraph under the second bullet on page 1-12, please note that the statement made is in regard to conclusions of the Supplemental Investigation report and so only addresses action levels in regard to samples collected from the off site ditch during the Supplemental Investigation. On pages 2-3 and 2-4 of the CMS Work Plan, on site surface water, as it relates to actions levels established by the USEPA (for location DW-B), is discussed. Therefore, it is not necessary to revise the referenced paragraph.

APPENDIX C

PRELIMINARY REPORT FORMAT
CORRECTIVE MEASURES STUDY AT
RMI SODIUM PLANT

APPENDIX C

PRELIMINARY REPORT FORMAT

PRELIMINARY REPORT FORMAT (Continued)

PRELIMINARY REPORT FORMAT (Continued)

Section No.	Title	Page No.
6.0	ANALYSIS OF CORRECTIVE MEASURE ALTERNATIVES	
6.1	Comparative Analysis of Alternatives Evaluated	
6.2	Final Screening of Corrective Measure Alternatives	

APPENDIX D

RMI TITANIUM CO. RESPONSES TO USEPA CMS WORK PLAN APPROVAL COMMENTS

APPENDIX D

RMI TITANIUM CO. RESPONSES TO USEPA CMS WORK PLAN APPROVAL COMMENTS

1. **Section 1.1, Page 1-1: Revise this section by adding the following language: "The U.S. EPA is also concerned about preventing additional groundwater contamination and about potential future impacts of groundwater contamination. Therefore, the remedies will also be evaluated in terms of reduction in sources of groundwater contamination. Remediation of existing groundwater contamination above action levels will also be considered. In addition, remediation of sediments affected by Solid Waste Management Units will also be evaluated."**

   Findings of the RCRA Facility Investigation (RFI) and evaluations conducted during the Health and Environmental Assessment (HEA) both revealed two factors critical to the assessment of groundwater conditions and potential need for groundwater remediation. First, during the RFI it was determined that the shallow water-bearing zone is characterized by low hydraulic conductivity. The subsequent potential well yield calculated was below the yield which has been set by the USEPA as being adequate for the needs of an average size household. As discussed in the HEA, no municipal wells and few domestic wells exist within the vicinity of the facility due to the low groundwater yields and abundant surface water supplies. Due to the location of the domestic wells there are no human receptors of groundwater emanating from the site. Therefore, since the HEA evaluates only complete exposure pathways, there is no potential for exposure to site constituents via the groundwater pathway. Thus, based on the findings of the RFI and HEA, it has been concluded that corrective action objectives to aggressively remediate groundwater are not appropriate. It is, however, appropriate to consider future potential impacts of waste sources upon groundwater at the site.

   As discussed and agreed in a meeting with the USEPA, Region V on October 22, 1991, the USEPA suggested text could be appropriately modified

for incorporation into the text. The first paragraph under Section 1.1, Page 1-1 has, therefore, been revised as follows.

In addition, remediation of sediments affected by Solid Waste Management Units will also be evaluated. There is also concern regarding future potential impacts to groundwater. Therefore, remedies will also be evaluated in terms of reduction in potential sources of groundwater contamination."

2. <u>Section 1.3.1, Page 1-3</u>: **Revise the paragraph starting with "In the RFI report..." as follows: "However, the U.S. EPA does not accept this conclusion regarding groundwater classification. The groundwater classification system was designed by the U.S. EPA as a guidance to States. The Ohio EPA has not adopted the groundwater classification system, and therefore the U.S. EPA will not recognize the application of the classification system by facilities in Ohio."**

It was demonstrated in the RFI and the HEA that the shallow water-bearing zone in the vicinity of the RMI Titanium Company Sodium Plant is characterized by low yield and that there are currently no potential human receptors of groundwater. For these reasons and due to the abundant surface water supplies, groundwater near the Sodium Plant is not expected to serve as a drinking water source. Since the OEPA has not adopted the USEPA groundwater classification system, the referenced paragraph on Page 1-3 of the CMS Plan has been revised to reflect the technical evaluation of the shallow water-bearing formation in the vicinity of the RMI Sodium Plant. The referenced paragraph now reads as follows.

"In the RFI report it was demonstrated that the uppermost water-bearing zone (or that in the glacial till) in the vicinity of the RMI Sodium Plant is characterized by low yield and, therefore, groundwater in this water-bearing zone is not expected to serve as a drinking water source. (Later, this was supported by the HEA where it was noted that there is an absence of human receptors of shallow groundwater and there is an abundance of surface water for use as a drinking water source.)"

This text was used in lieu of the text suggested in the USEPA comment based on the conversations held in a meeting with the USEPA, Region V on October 22, 1991. During the meeting the USEPA agreed that appropriate text, other than that presented in the USEPA comment, could be used for incorporation into the revised CMS Plan.

3. <u>Section 1.3.1, Page 1-4</u>: **Revise the paragraph labelled Air to include a discussion of air monitoring results during well development for the wells where DNAPL was detected.**

The referenced paragraph has been revised as follows:

"...during field activities, with the exception of observed HNU readings in the vicinity of the borehole during drilling of PZ-9 (at 19 feet) and PZ-8 (at 10 feet), and in the soil headspace HNU readings of soils collected from borings 1S and 2S. These borings are all located in the vicinity of the southern property boundary where a dense non-aqueous phase liquid (DNAPL) originating off the site was detected. The detection of the DNAPL is further discussed in this section under **Off-Site Source(s)**. Although no air monitoring..."

4. <u>Section 1.3.1, Page 1-4</u>: **Revise the first paragraph under the heading of Groundwater by adding the following sentences: "Levels of barium above action levels set by U.S. EPA were also detected in well 3S (1200 ppb), and levels of cadmium above action levels were detected in well 4S (14.3 ppb). These wells are located east and north of the landfill area."**

The suggested text has been added to the referenced paragraph as indicated below.

"near Area D. Levels of barium above action levels set by USEPA were also detected in well 3S (1200 ppb), and levels of cadmium above action levels were detected in well 4S (14.3 ppb). These wells are located east and north of the landfill area."

In addition, the following text has been added to provide a summary of more recent monitoring well sampling results where action levels previously were exceeded. This text was incorporated as a new paragraph following the above referenced paragraph.

"More recent sampling of these monitoring wells where action levels were previously exceeded indicates a significant reduction in constituent levels. Barium, previously detected in well 8S at 1,900 ppb, has since been detected at 830 ppb. Cadmium, previously detected in wells 4S (14.3 ppb) and 6S (25.7 ppb), has since been found at 1.9 ppb and 7.7 ppb, respectively, in these wells. In addition, the USEPA has recently promulgated new MCLs (the original basis for action levels) for barium and cadmium at 2,000 ppb and 5 ppb, respectively. In comparison, all of the most recent sample results for barium are below the promulgated MCL for barium and all of the most recent sample results for cadmium are below or near the promulgated MCL for cadmium."

5. <u>Section 1.3.1, Page 1-5</u>: **Revise the first paragraph by adding the following after the sentence ending "...naturally occurring.": "However, the ratios for wells 9S and 9D do not follow this pattern. The chloride concentration in well 9S (70 ppm) is much less than in 9D (11,900 ppm), indicating that the chloride ratios are not consistent across the site. Therefore, the conclusions to be drawn from these ratios are somewhat limited. However, upon evaluating all existing information on site conditions, it appears that water quality in the bedrock groundwater is not likely to be significantly affected by the SWMUs on site." The sentence beginning with "Therefore, water quality..." should be omitted.**

As discussed in the meeting with the USEPA, Region V on October 22, 1991 the chloride/barium ratio in monitoring wells 9S and 9D are not expected to follow the pattern in other site monitoring wells due to the localized influence of the Ashco reservoir. The referenced paragraph has been revised to read as follows.

"...in shallow groundwater. (It is noted that the ratios for wells 9S and 9D do not follow this pattern. The chloride concentration in well 9S (70 ppm) is much less than that in 9D (11,900 ppm) due to the localized influence of the Ashco water supply reservoir.)"

6. <u>Section 1.3.1, Page 1-6</u>: **Revise the sentence in the first paragraph beginning with "The concentration of constituents...", as follows: "The concentration of barium in the french drain samples was lower than the pond water samples, and the concentration of cadmium in the french drain samples was similar to the pond water samples, with the exception of one cadmium sample which was substantially higher in the french drain sample (26.8 ppb in MHW-5)."**

The referenced paragraph has been modified as requested.

7. <u>Section 1.3.2, Page 1-7</u>: **Revise the first paragraph under the heading of Groundwater as described above for the comment under Section 1.3.1, Page 1-4, for the Groundwater section.**

The referenced paragraph has been modified as it was previously for USEPA comment number 4 at Section 1.3.1, Page 1-4.

8. <u>Section 1.3.2, Page 1-7</u>: **Revise the last paragraph on this page as described above for the comment under Section 1.3.1, Page 1-3.**

The referenced paragraph has been modified by the addition of text similar to that used previously for the response to USEPA comment number 2 at Section 1.3.1, Page 1-3, as presented below.

"In the RFI report it was demonstrated that the uppermost water-bearing zone (or that in the glacial till) in the vicinity of the RMI Sodium Plant is characterized by low yield. In addition, no receptors of shallow groundwater in the vicinity of the RMI plant were identified, because the majority of the local population relies on surface water for drinking water supplies. Thus, the uppermost formation is not expected to serve as a source of drinking water."

9. **Section 1.3.2, Page 1-8: The first paragraph under the heading of Soil states that arsenic was found in "remarkably consistent concentrations throughout the site." However, arsenic was measured in concentrations in excess of statistically determined background levels for Areas B, C, F, and G. These two conclusions cannot both be correct. Address this issue in a revised version of this paragraph.**

The fact that concentrations of arsenic were found at consistent levels in soils at the site and the fact that concentrations of arsenic in surficial soils collected from some site areas were statistically significant as compared to background concentrations are not contradictory, as discussed during the October 22, 1991 meeting between RMI and the USEPA.

This paragraph has been revised as follows:

"... leaching of constituents. Arsenic was found in remarkably consistent concentrations in surficial and subsurface soils collected throughout the site. The range of average concentrations of As in soils from less than one foot in depth to 58 feet in depth was 16.4 to 22.8 ppm. Although concentrations of As in soils were found to be consistent, levels of As in surficial soils from Areas B, C, F, and G were found at concentrations which were statistically significant (greater) as compared to background concentrations."

10. **Section 1.3.2, Page 1-9: The second paragraph on this page discusses conclusions on erosion losses. These conclusions, based on theoretical models, do not accurately reflect actual site conditions. On June 13, 1991, U.S. EPA representatives observed machinery operating in Areas B and C which could affect surficial soil erosion rates. Therefore, only minimal significance can be given to the predicted erosion rates. The sentence starting with "Using the most..." must be omitted. In addition, after the sentence ending "...sludge disposal loading rates", add the following: "However, the U.S. EPA does not recognize this comparison as having any regulatory significance for RCRA corrective action decisions. In addition, the U.S. EPA has stated its concern for potential future exposures to contaminated soils on site."**

The activity observed by the USEPA on site on June 13, 1991 was minimal and involved placement of cells into an area west of Area C for storage following the decommissioning of the cells from manufacturing operations. Therefore, very little, if any, of the activity observed actually occurred in the western portion of Area C and none of the activity occurred in Area B. The significance of this activity relative to soil erosion in Areas B and C is, therefore, minor. The erosion estimates (which were estimated when the original RFI was submitted in 1989), therefore, are still considered relevant to site conditions for the purposes for which they were originally derived. Potential erosion of site constituents was identified in the RFI as a potential migration pathway of concern. Currently, the USEPA has no criteria or standards to evaluate the significance of erosion rates. Furthermore, as stated on page 1-9 of the CMS Plan, because site access is restricted and there were no receptors identified in the immediate vicinity of the site, comparisons to criteria involving human exposures were not considered appropriate. The statement in the USEPA comment "In addition, the USEPA has stated its concern for potential future exposures to contaminated soils on site" appears unrelated to this section of the CMS Plan and has not been included in the revised version of this paragraph.

This paragraph will be revised as follows:

"...with regard to erosion. However, as stated in their September 24, 1991 comments on the RMI Sodium Plant revised CMS Work Plan, the USEPA notes that this comparison does not have any regulatory significance for RCRA corrective action decisions."

11. **<u>Section 1.3.2, Page 1-9</u>: For the first paragraph under the heading of Surface Water, revise the sentence starting with "The concentrations...", as described above for the comment under Section 1.3.1, Page 1-6.**

The referenced paragraph has been modified as requested.

12. **<u>Section 1.3.2, Page 1-10</u>: Add to the last paragraph under Surface Water on this page: "However, the U.S. EPA has determined that a**

surface water action level has been exceeded for sampling location DW-B for cadmium, applying the use designation for the Fieldsbrook tributary to the on-site tributary. In addition, in September 1990 U.S. EPA representatives observed frogs in the DS tributary on site. Therefore, higher aquatic species are present periodically in this tributary."

The paragraph has been revised as requested. Please note that the action level comparison was (and is still) provided on page 2-3 in Section 2.2.2.3.

13. **Section 1.3.2, Page 1-10: Add the following sentence to the section under the heading of Air:**

"However, the U.S. EPA has determined through field observation that trace quantities of metals absorbed onto the surficial soils may migrate via fugitive dust, exposing workers on site to this dust."

Please note that the possibility of fugitive dust migration was noted on page 1-4, and reduction of water and wind erosion of surficial soils in SWMU areas is explicitly stated as a corrective action objective in Section 2.2.2.6. However, it is misleading to infer that the airborne behavior of "trace quantities of metals adsorbed onto surficial soils" could be observed through "field observations." Although the potential for fugitive dust emissions may have been observed by the USEPA, no substantiation of the quantities of metals in fugitive dust can be made without monitoring data. Furthermore, as repeatedly stated in the responses to the USEPA's comments on the draft RFI (ECKENFELDER INC., June 11, 1990), RMI workers were not considered members of the general population, and the evaluation of potential exposures to workers is beyond the scope of the RFI. The consideration of worker exposure is not consistent with the current RCRA federal guidance, and such potential exposures are regulated by OSHA.

This paragraph will be revised as follows:

"No sources or potential release mechanisms were considered relevant to the air pathway because of the lack of on-site receptors, with the possible exception

of RMI workers. However, potential exposures to site workers are regulated by OSHA, and are not relevant to the RFI or CMS process. Although no air monitoring data are available for metals, it is possible that trace quantities of metal which may be sorbed to surficial soil may migrate via fugitive dust."

14. Section 1.3.3, Page 1-11: **The fifth "bullet" on this page should be revised as follows: "Literature on barium concentrations in the Chagrin Shale provide information that supports the conclusion that barium in the bedrock underlying the RMI site is likely to be naturally occurring."**

It should be noted that the ODNR publication referenced in the Supplemental RFI Report gives metals concentrations for oil field brines. The depth to the Chagrin Shale is much greater in southern Ohio than at the RMI site. Therefore, because the concentrations of most metals increase with depth, it would be probable that the barium concentrations in the Chagrin Shale cited for southern Ohio would be greater than at the site. Therefore, although the barium concentrations for the Chagrin Shale in southern Ohio cannot be directly compared to the values on site because of the depth differences, the values reported show that barium concentrations in groundwater from shale are much higher than groundwater from other aquifer types) i.e., sandstone, sand and gravel, clayey till, etc.).

The requested text modification to the referenced paragraph has been made.

15. Section 1.3.3, Page 1-12: **Add the following to the first "bullet" on this page: "However, because the cause of the decrease in cadmium levels is unknown, it is not known whether the decrease is a trend that will continue."**

In addition to the requested text modification, the following statement has been added to the referenced "bullet".

"Since RMI has implemented process changes eliminating the use of cadmium in the manufacturing process over 2.5 years ago, there is no reason to believe

that the recently observed trend of decreasing cadmium levels in shallow groundwater monitoring wells will not continue."

16. **Section 1.3.3, Page 1-12: Revise the last sentence on this page as follows: "None of the proposed groundwater action levels were considered relevant because RMI has attempted to previously demonstrate that shallow groundwater meets the requirements of a Class IIIA designation. However, the U.S. EPA does not accept this conclusion regarding groundwater classification. The groundwater classification system was designed by U.S. EPA as a guidance to States. The Ohio EPA has not adopted the groundwater classification system, and therefore the U.S. EPA will not recognize the application of the classification system by facilities in Ohio. In addition, it was determined that it is not likely that deep bedrock groundwater is being affected by Sodium Plant activities."**

As noted in the responses to USEPA comment numbers 1 and 2, shallow groundwater in the vicinity of the RMI Sodium Plant is characterized by low yield and the absence of human receptors. The sentence referenced in the USEPA comment has been revised to read as follows.

"None of the proposed groundwater action levels were considered relevant because RMI has demonstrated that the shallow water-bearing zone is characterized by a low yield and because of the absence of human receptors in the vicinity of the RMI Sodium Plant. For these reasons and due to the abundant surface water supply, it is not expected that the shallow water-bearing formation would be used as a drinking water source. In addition, it was determined that it is not likely that deep bedrock groundwater has been affected by Sodium Plant activities."

17. **Section 1.3.3, Page 1-13: Revise the second sentence on this page as follows:"...ditch during the Supplemental RFI sampling."**

The referenced sentence has been modified as requested.

18. Section 2.2.1, Page 2-2: **For the second paragraph under the heading of Groundwater, revise the second sentence as follows: "...because it has been demonstrated that it is not likely that the deeper water-bearing zone is being affected by Sodium Plant activities."**

Revise the third sentence as follows: "Furthermore, RMI has attempted to demonstrate during the RFI process that shallow site groundwater meets the requirements of a Class IIIA designation. However, the U.S. EPA has not accepted this conclusion regarding groundwater classification. The groundwater classification system was designed by the U.S. EPA as a guidance to States. The Ohio EPA has not adopted the groundwater classification system, and therefore the U.S. EPA will not recognize the application of the classification system by facilities in Ohio. Therefore, proposed groundwater action levels will be addressed by the CMS." Omit the fourth sentence of the second paragraph.

The second sentence referenced has been modified as requested. The third and fourth sentences of the referenced paragraph have been deleted and the remainder of the paragraph now reads as follows.

"The RFI demonstrated an insufficient yield for domestic use of the shallow water-bearing zone and the HEA demonstrated the absence of potential receptors via the groundwater pathway. In addition, it was determined that it is not likely that deep bedrock groundwater has been affected by Sodium Plant activities. For these reasons and due to the abundant surface water supply, it is not expected that the shallow water bearing zone would be used as a drinking water source. Therefore, proposed groundwater action levels will be addressed by establishing appropriate corrective action objectives for waste sources."

19. Section 2.2.4, Page 2-3: **Revise the third sentence of the second paragraph under the heading of Deep Soils, as follows: The results of the tests indicated that neither cadmium or lead is likely to leach from the subsoils (barium was not measured) at levels that would cause the subsurface soils to be classified as a hazardous waste, i.e.,**

the EP Toxicity Limits were not exceeded for any sample." Omit the sentence starting with "Also, as...". Revise the next sentence as follows: "Based on the previously presented evaluation and data, the potential for deep soils to act as a source for groundwater will be considered during the CMS. The following U.S. EPA guidance document will be utilized: EPA 540/2-89/057. Determining Soil Response Action Levels Based on Potential Migration to Groundwater, U.S. EPA, OERR, October 1989."

The following text has been added to the referenced paragraph following the third sentence.

"In addition, the test results indicate that neither cadmium nor lead are likely to leach and cause subsurface soils to be classified as hazardous waste. Based on the previously presented evaluation and data, the potential for constituent migration from deep soils will be considered during the CMS. The following USEPA guidance document will be utilized as appropriate: EPA 540/2-89/057, Determining Soil Response Action Levels Based on Potential Migration to Groundwater, USEPA, OERR, October 1989."

20. **Section 2.2.2.5, Page 2-4: Add the following to the section under the heading of Summary of Areas to be Addressed in the CMS: "In addition, areas where groundwater samples exceeded the action levels will be addressed in the CMS: Well 3-S, Well 6-S, and Well 8-S for barium; Well 4-S, Well 6-S, and Well 8-S for cadmium."**

The requested modification to the referenced section has been made.

21. **Section 2.2.2.6, Page 2-4: Add the following to this section:**

" • Reduce the potential for groundwater contamination from constituents present in identified SWMUs."

" • Reduce the potential for exposure to groundwater contamination by on-site or off-site receptors."

The requested text changes have been slightly modified, as agreed during the October 22, 1991 meeting, and added to the referenced section as indicated below.

" • Reduce the potential for future groundwater contamination from constituents present in identified SWMUs."

" • Reduce the potential for future exposure to groundwater contamination by on-site or off-site receptors."

22. **Table 2-1, Page 2-5: State the criteria used for determining "Approximate Vertical Extent." For example, the vertical extent for surficial soils is 4 inches for Areas B and C, whereas the depth for Areas F and G is 6 inches. Also, state why the vertical extent for Area D is 3 to 6.5 feet whereas on Page 1-8, Paragraph 2, it is stated that elevated concentrations in Area D were found at depths of between 6.5 and 13.3 feet. Finally, state how the vertical extent of 0.5 to 3.3 feet was determined for shallow soils in Area G when no "gradient" of waste constituents was observed.**

Responses to these USEPA comments are as follows.

First, in areas where the "Approximate Vertical Extent" is indicated to be "0 to 4 inches" or "0 to 6 inches", the approximate depth should actually have been stated to be "0 to 4 inches". This depth represented the surficial soil sampling interval. The "Approximate Vertical Extent" indicated for "Surficial Soils" in Table 2-1 will be modified for Areas B and C to indicate "0 to 4 inches".

Second, as reported on page 2-20 of Corrective Measures Study (Partial Submittal - ECKENFELDER INC., June 1990), the "Average subsurface soil concentrations were highest in the first layer (3.0 to 6.5 feet) for Ba, Pb, and Ni, but tended to decrease greatly with depth for constituents." Although no USEPA action levels were established for lower subsurface soils (generally below 3 feet), the 3 to 6.5 foot depth interval was included in the CMS Plan for evaluation in the CMS. Since average concentrations of constituents of interest were not at levels of concern, subsurface soils at a depth greater than

6.5 feet were not included in the CMS Plan for evaluation in the CMS. Therefore, the CMS Plan will not be revised as a result of the USEPA's comment regarding the vertical extent for Area D.

For Area G, a soil depth interval of 0.5 to 3.3 feet was set forth as the "Approximate Vertical Extent" to be addressed by the CMS on the basis that USEPA action levels applied to shallow or near subsurface soils (approximately 3 feet). USEPA action levels were not established for lower subsurface (deep) soils. Also, although "no gradient" was observed, subsurface soil sample intervals below 3.3 feet did not reveal concentrations of constituents of interest at levels of concern. Therefore, the subsurface soil below a depth of 3.3 feet in Area G was not included in the CMS Plan to be evaluated by the CMS. Therefore, the CMS Plan text will not be revised as a result of the USEPA's comment regarding the vertical extent in Area G.

23. <u>Table 2-1, Page 2-5</u>: **Revise this USEPA's table to include areas where groundwater action levels were exceeded.**

Table 2-2 has been added to present analytical data for monitoring wells near site areas and USEPA groundwater action levels.

24. <u>Section 2.3, Page 2-7</u>: **Revise the third "bullet" on this page as follows:**
" • Cost effectiveness as compared to the degree of environmental protection provided by potential corrective measure technologies will be considered, but is not an explicit decision criteria."

Add the following "bullets":

" • Control the source(s) of releases so as to reduce or eliminate, to the extent practicable, further releases of hazardous wastes (including hazardous constituents) that may pose a threat to human health and the environment."

" • Comply with applicable standards for management of wastes."

The referenced text (bullets) has been revised as follows.

The third bullet has been revised to read as follows.

" • Cost effectiveness as compared to the degree of environmental protection provided by potential corrective measure technologies will be considered, but will not be used as the sole criteria for eliminating technologies."

The first and second additional bullets requested by the USEPA comment are not necessary since they were previously addressed by the overall objectives established under Section 2.2.1.

25. **<u>Section 2.3, Page 2-7</u>: To the paragraph beginning with "The process described...", add the following: "Groundwater contamination will also be addressed at areas previously determined to be above action levels."**

As indicated in the response to comment number 1, concerns regarding future potential impacts to groundwater will be addressed by addressing the presence of waste sources.

The referenced paragraph has been revised as follows.

". . . need for corrective measures. The potential for future impacts to groundwater will also be addressed by evaluating remedies in terms of reduction in potential sources of groundwater contamination."